



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Thomas Eckel et al.  
Serial No. : 09/720,280  
Filed : December 21, 2000  
For : FLAME-RESISTANT POLYCARBONATE/ABS  
PLASTIC MOLDING MATERIALS  
Art Unit : 1714  
Examiner : Veronica Hoke

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DECLARATION

I, Thomas Eckel, residing at Pfauenstr. 51, 41540 Dormagen, Germany, declare as follows:

- 1) that I have the following technical education and experience:
  - a) I am a chemist having studied at the Phillips-Universität of Marburg, Germany, from 1978 to 1987,
  - b) I received the degree of doctor rer. nat. at the Phillips-Universität of Marburg in the year of 1987,
  - c) I am employed by Bayer AG since July 1987 in the Research Department especially handling polymer blends;
- 2) that the following tests were carried out under my immediate supervision and control:

## **Experimental results**

### **Component A**

Linear polycarbonate based on bisphenol A with a relative solution viscosity of 1.252, measured in CH<sub>2</sub>Cl<sub>2</sub> as solvent at 25 °C and a concentration of 0.5 g/100 ml.

### **Component B**

Graft polymer consisting of 40 parts by wt. of a copolymer from styrene and acrylonitrile in the ratio of 73 : 27 on 60 parts by wt. of crosslinked polybutadiene rubber in particulate form (mean particle diameter  $d_{50} = 0.28 \mu\text{m}$ ), prepared by emulsion polymerization.

### **Component C**

Styrene/acrylonitrile copolymer with a styrene/acrylonitrile ratio by weight of 72 : 28 and an intrinsic viscosity of 0.55 dl/g (measurement in dimethyl formamide at 20 °C).

### **Component D**

P-3800 from Nippon Soda Co. Ltd., Japan (a phenoxyphosphazene compound).

### **Component D1**

Triphenyl phosphate, Disflamoll TP<sup>®</sup> from Bayer AG.

### **Component D2**

m-Phenylene-bis (di-phenylphosphate), Fyrolflex<sup>®</sup> from AKZO Nobel Chemicals GmbH.

### **Component D3**

Bisphenol-A-based oligophosphate, Reofos BAPP from Great Lakes Chem.

### **Component E**

Pural<sup>®</sup> 200, an aluminium hydroxide (from Condea, Hamburg, Germany), average

particle size approx. 50 nm).

### **Component F**

Tetrafluoroethylene polymer as a coagulated mixture prepared from SAN graft polymer emulsion corresponding to the above stated component B in water and a tetrafluoroethylene polymer emulsion in water. The weight ratio of graft polymer B to the tetrafluoroethylene polymer F in the mixture is 90 wt.% to 10 wt.%. The tetrafluoroethylene polymer emulsion has a solids content of 60 wt.%, the average particle diameter is between 0,05 and 0,5  $\mu\text{m}$ . The SAN graft polymer emulsion has a solids content of 34 wt.% and an average latex particle diameter of  $d_{50} = 0.28 \mu\text{m}$ .

### **Production of F:**

The emulsion of the tetrafluoroethylene polymer (Teflon 30 N from DuPont) is mixed with the emulsion of the SAN graft polymer B and stabilised with 1.8 wt.%, relative to polymer solids, of phenolic antioxidants. At 85 to 95°C, the mixture is coagulated at pH 4 to 5 with an aqueous solution of  $\text{MgSO}_4$  (Epsom salts) and acetic acid, filtered and washed until virtually free of electrolytes, then the principal quantity of water is removed by centrifugation and the material then dried at 100°C to yield a powder. This powder may be compounded with the other components in the units described.

The components are mixed in a 3 liter internal kneader. The compositions described in the table below were prepared on an injection molding machine, Arburg 270 E type, at 260 °C and their properties were determined.

The determination of the notched impact strength  $a_k$  is carried out to ISO 180/1 A.

The determination of the Vicat B softening point takes place to DIN 53 460 (ISO 306) on rods 80 x 10 x 4 mm<sup>3</sup> in size.

Weld line strength is determined by measuring the impact strength to DIN 53 453 at the weld line of test specimens injection molded from both sides (processing

temperatures 260°C) of dimensions 170 x 10 x 4 mm.

Stress cracking behavior (ESC behavior) was investigated on bars of dimensions 80 x 10 x 4 mm, processing temperature 260°C. The test medium used was a mixture of 60 vol.% toluene and 40 vol.% isopropanol. The test pieces were pre-stressed on a circular arc template (initial elongation in percent) and were immersed in the test medium at room temperature. Stress cracking behavior was evaluated on the basis of cracking or failure as a function of initial elongation in the test medium.


The fire behavior of the samples was measured to UL-Subj. 94 V on rods 127 x 12.7 x 1.6 mm in size produced on an injection molding machine at 260 °C.

**Table**

<b>Components (parts by weight)</b>	<b>2</b>	<b>3</b>	<b>4 (Comp.)</b>	<b>5 (Comp.)</b>	<b>6 (Comp.)</b>	<b>7 (Comp.)</b>	<b>8 (Comp.)</b>
<b>A</b>	66.7	66.7	67	67	67	67	67
<b>B</b>	7.3	7.3	7.5	7.5	7.5	7.5	7.5
<b>C</b>	9.4	9.4	9.5	9.5	9.5	9.5	9.5
<b>D</b>	13.0	11.0					
<b>D1</b>			12.0				
<b>D2</b>				12.0			
<b>D3</b>					13.0	12.0	11.0
<b>E</b>	1.0	1.0	1.0	1.0	1.0	1.0	1.0
<b>F</b>	4.2	4.2	4.2	4.2	4.2	4.2	4.2
<b>Properties</b>							
<b>a<sub>K</sub> [kJ/m<sup>2</sup>]</b>	58	59	37	33	42	44	46
<b>Vicat B 120 [°C]</b>	104	110	88	94	100	103	106
<b>a<sub>n</sub> (weld line) [kJ/m<sup>2</sup>]</b>	17.8	17.8	8.5	8.9	8.1	8.3	8.6
<b>ESC behaviour, failure at ε [%]</b>	1.8	2.0	1.6	1.8	1.8	2.0	2.0
<b>UL 94 V 1.6 mm</b>	V-0	V-0	V-0	V-0	V-0	V-0	V-0

The results show the critical dependence of notch impact strength and the weld line strength on the phosphorous compound. The inclusion of the claimed phosphorous compound offers significant advantages over a differently structured phosphorous compound.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

A handwritten signature in cursive script, appearing to read "Thomas Eckel", is written over a horizontal line.

THOMAS ECKEL

Signed at Dormagen, this *18*. day of *March*, 2005.